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REMARKS

The present application relates to a method of treating or inhibiting the growth of cancer cells by administering certain substituted triazolopyrimidines.

Claims 2-4, 6-8, 10-12, 14-15, 17-20, 22, 67, 74-77, 79-81, 83-85, 87-88, 90-93 and 95-98 are pending in the application. Applicants thank the Examiner for acknowledging the addition of "cervical cancer" to claim 67 by the applicants' amendment of May 16, 2005. Said amendment to claim 67 is supported by the specification and introduces no new matter.

In the office communication of August 9, 2005 the Examiner has retained the rejection of claims 2-4, 6-8, 10-12, 14-20, 22, 67, 74-77, 79-81, 83-85, and 87-93 and 95-97 under 35 USC §112, first paragraph, because the specification, while being enabling for the treatment of lung cancer, gliobastoma, melanoma, colon cancer and cervical cancer does not reasonably provide enablement for the treatment of other types of cancer, or the treatment of cancerous cells that express multiple drug resistance (MDR). Further, the Examiner has rejected claim 98 as being dependent on claim 67.

Applicants respectfully traverse the rejection and believe that the application is patentable under 35 USC §112, first paragraph and urge withdrawl of this rejection. Applicants maintain that one of ordinary skill in the art would, in view of the applicants' written description in the specification, be able to use the invention commensurate in scope with the claims as amended. Support for the claims as amended is found throughout the specification. The applicants do not believe that the Examiner has set forth a proper basis for rejection of claim 98. It is rejected merely as being dependent on claim 67. If it was the Examiner's intention to object to the claim as being allowable except for being dependent upon a rejected base claim, applicants would have amended the claim to be independent and would do so if notified by the Examiner that it would place the claim in condition for allowance. Applicants have also added new dependent claim 99 which is directed to certain cancerous cell types that even the Examiner admits are enabled.

The Examiner also acknowledges that a large number of the compounds of Formula (I) were tested by applicants, but contends that the tested compounds of Formula (I) tend to have R³

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as Cl, R⁴ as hydrogen, R² as phenyl substituted with fluoride (e.g., difluorophenyl, trifluorophenyl or trifluoromethyl-phenyl) and R¹ is not as extensively substituted.

In response, applicants respectfully traverse the rejections regarding substitutions at R¹, R², R³ and R⁴ as described by the Examiner. Applicants have provided in the specification, over 200 working examples and their corresponding standard pharmacological test results with diversity in substituents to support of the breath of claim 2.

As to R^1 , applicants have provided over 100 separate moieties from the presented working examples in traverse of the Examiner's statement that R^1 is not extensively substituted. Applicants provide the following summary table in support of the diversity in the substitution of R^1 . As presented in the following table, R^1 moieties are bonded through carbon, nitrogen, sulfur or oxygen to the remainder of the Formula (I) molecular structure.

Diversity to R ¹ substitution	
Example Numbers	Moiety
2, 4, 13, 14, 17, 21,33, 44,	
50, 80, 84, 90, 93, 94, 97,	ξ ,/
100, 101, 104, 106, 107, 118,	ξ-"\
125, 160, 172, 226, 227, 228,	
247, 274, 275	
3, 12	
	ξ-n
6, 22, 23, 24, 103	
	ξ-N
7, 48, 55, 58, 65, 83, 89, 185	
	ξ-N_s
8	N N N N N N N N N N N N N N N N N N N

Diversity to R ¹ so	ubstitution (cont)
Example Numbers	Moiety
9	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
15, 16,	
	ξ-N
18, 19	
25, 242	
27, 35, 57, 63, 70, 77, 78, 81,	
88, 110, 188, 208, 230, 248	
28, 73, 74, 178	_
	S NH F

Diversity to R ¹ s	ubstitution (cont)
Example Numbers	Moiety
29, 266	
	CI
30	
	ξ—√ OH
32	
	NH NH
34, 64, 192, 235, 265, 269	
	NH
37, 236, 237, 238	
	-NH ₂
38	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
39	
40	
	CI N
42, 184	

Diversity to R ¹ substitution (cont)	
Example Numbers	Moiety
45, 109	
	-CH ₂ OH
46	
	— N — ОН
47, 59	
	ξ—ν—cι
49, 69	
	ξ-n—
51	
	~~~
52	
53, 245	3000
	N N N N N N N N N N N N N N N N N N N
54, 61, 62	
	<b>ξ</b> -N—Br
56, 82, 179	
	NH XX
60	
	_NCF ₃

Diversity to R ¹ s	ubstitution (cont)
Example Numbers,	Moiety
67, 108	
	○N → N
68	
	<b></b> ₹− <i>N</i> ←
75, 92	
	$\bigcirc$
76	
	s
79	
	NH
86	S F
87	
113	
	\$N
91, 111	
	and o
95	

Diversity to R ¹ substitution (cont)	
Example Numbers	Moiety
96	
	-CH ₂ -Cl
99	
	N N N N N N N N N N N N N N N N N N N
102	
105, 112, 183, 217, 219, 221,	
262, 264, 267	
	HN
	~~~
114	
	Br
116, 239, 268	
	NH
241	
	\$_NH_O
36	·

Diversity to R ¹ so	ubstitution (cont)
Example Numbers	Moiety
244	
245	
31, 72, 224, 159,	HN
222, 223, 246,	nur
249	
117	and z
119	S S C C C C C C C C C C C C C C C C C C
120	www.
121, 122, 123, 124, 126, 127, 128, 135, 187, 205,	NH NH

Diversity to R ¹ substitution (cont)	
Example Numbers	Moiety
129, 130	
	25 N F
131, 132, 133, 270, 271	
	NH F F
134	
	and z
136	
137	\$_N_F
138	2000
139	
	NH NH
140, 152, 173, 211	
	NH F
141	
	\$_n
142	
	~~~

Diversity to R ¹ substitution (cont)	
Example Numbers	Moiety
143	
	₹ F
144	F '
	N N
145	
,	825
146	
	2 /
147	
148	
	Son
149	
150	
	\$ N
151, 156, 157, 161, 164, 165,	
174, 176, 206, 254, 273,	
153	
	\$ F
	F

Diversity to R ¹ substitution (cont)	
Example Numbers	Moiety
154	
	, –
155	
	\$ NH
158	
	\$N
168	
	<b>}</b> —
167, 181	
	<b>\}</b>
182	
	-NH ₂
177, 189,	
	<b>ξ</b> —
193	
	HN F
253	
	SAN HOUSE
194	
	\$ NH F
L	<u> </u>

Diversity to R ¹ s	ubstitution (cont)
Example Numbers	Moiety
195	soon of
	sa M
196	_
	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
197	
272	H CIIIH
250	
162	NH F
163	NH F F
166	2222 F F

Diversity to R ¹ so	ubstitution (cont)
Example Numbers	Moiety
169	F F
170, 175, 199	NH NH
152, 171, 173, 180, 190, 191,	F, F
270, 200, 201, 202, 203, 204,	
207, 209, 210, 271,	NH
255, 256	
	S Br
257	Br Br
212	NH a
258	NH O
259	min N
213	N-zzz
260	HN N

Diversity to R ¹ substitution (cont)	
Example Numbers	Moiety
214	
	No N
215	Sandara Sandara
216	N N N N N N N N N N N N N N N N N N N
243, 261,	
	Solve H
263	John John John John John John John John
218, 220	
	rock.
221	HN ARA
231, 233	\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
232	

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Diversity to R ¹ substitution (cont)	
Example Numbers	Moiety
241	HN
98	§_N_

Specifically, applicants have provided working examples with supporting pharmacological testing data in support of the structural diversity for example where R¹ is alkyl (eg. Examples 138, 142, 145, 148, 149, and 196) and substituted alkyl (eg. Examples 45, 95, 96, 109, 114, 153, 244 and 249), alkenyl (eg. Example 95), cycloalkyl (eg. Examples 151, 156, 157, 273, 161, 164, 165, 174, 176, 197, 206 and 254) and substituted cycloalkyl (eg. Examples 189, 177), cycloalkenyl (eg. Examples 176, 168, 181), substituted cycloalkenyl (eg. 108) and further where aryl (phenyl), Example 147, substituted aryl (eg. Examples 154, 231-233, 255-257), heterocyclyl of 5 or 6 ring atoms (eg. Examples 3, 12, 7, 48, 51, 55, 58, 65, 83, 89, 185, 75, 92), heterocyclyl of 5 or 6 ring atoms substituted (eg. Examples 2, 4, 13, 14, 17, 21,33, 44, 50, 80, 84, 90, 93, 94, 97, 100, 101, 104, 106, 107, 118, 125, 160, 172, 226, 227, 228, 247, 274, 275, 6, 22, 23, 24, 103, 15, 16, 18, 19, 30, 39, 46, 47, 59, 49, 69, 52, 53, 245, 54, 61, 62, 60, 68, 87, 158, 245, 259, 213, 215, 216) additionally where Ra and/or Rb are H or alkyl(eg Examples 37, 236, 237, 238, 9, 8, 27, 35, 57, 63, 70, 77, 78, 79, 81, 88, 110, 188, 208, 230, 248, 28, 73, 74, 178, 29, 266, 32, 34, 64, 192, 235, 265, 269, 38, 39, 40, 56, 82, 179, 79, 113, 116, 239, 268, 246, 222, 223, 117, 121, 122, 123, 124, 126, 127, 128, 135, 187, 205, 129, 130, 134, 136, 137, 141, 144, 146, 150, 182, 214) and still further where Ra and/or Rb are H or substituted alkyl (eg. Examples 25, 28, 73, 74, 178, 40, 102, 241, 140, 152, 131, 132, 133, 270, 271, 173, 211, 139, 143, 155, 194, 162, 163, 166, 169, 170, 175, 199, 152, 171, 173, 180, 190, 191, 270, 200, 201, 202, 203, 204, 207, 209, 210, 271, 212, 258, 260, 241, 242, 29, 266) Additional categories include where Ra and/or Rb are H or alkenyl (eg Examples 36, 261, 243), Ra and/or Rb are H or bicycloalkyl (eg. Examples 31, 72) and Ra is alkyl Rb is alkenyl (eg Examples 99, 113)

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As to R² and in traverse of the Examiner's statement that R² is not extensively substituted applicants have provided over 50 unique separate working examples. Because of the restriction requirement of September 30, 2003 and applicants' election of R² to be substituted phenyl, applicants have provided the following summary table in support of the diversity of the substitutents on the phenyl of R². As presented in the table R² substituents are not limited to (e.g., difluorophenyl, trifluorophenyl or trifluoromethyl-phenyl) as the Examiner contends. Substituents also include for example alkoxy (e.g. examples 3, 14, 15, 57, 58, 229, 68, 69, 218, 220, 222, 229, 231, 255, 263, 266, 21, 22, 31, 38, 39, 229, 78, 112, 172, 173, 174, 175, 176, 181, 182, 183, 184, 185, 187, 188, 189, 195, 196, 197, 205, 207, and 210), substituted alkoxy (e.g. 65, 100, 190, 191, 200, 211, and 254), alkenyloxy (e.g. 270 and 271), thioalkyl (e.g. examples 80, 81, 82, 83, 230, and 246), chlorothioalkyl (e.g. 228), bromo (e.g. 16, 236, 56 and 128), nitro (e.g. 70), amino (e.g. 93), acetamido (e.g. 94), dimethylamino (e.g. 106), benzyloxy (e.g. 265), phenyl (e.g. 264), unsubstituted (e.g. 232, 233, 261 and 262), phenoxy (e.g. 101, 103, and 248), benzyloxy (e.g. 265), t-butyl (e.g. 13, 23, and 269), methyl (e.g. 55, 126, 130, 143, 219 and 268), chloro(e.g. 62, 74, 140, 221, and 256), trimethyl(e.g. 77), trifluoromethyldichloro (e.g. 84, 88 and 89), fluoro nitro (e.g. 159 and 160), chloro nitro(e.g. 104, 110), bromo choro (e.g. 152), difluoro methoxy (172, 173, 174, 175, 176, 181, 182, 183, 184, 185, 187, 188, 189, 195, 196 and 197), dichloro fluoro(e.g. 178 and 179), difluoro hydroxyl (e.g. 180 and 199), perfluoro (e.g. 144, 146, 117, 272, 122 and 157), dichloro (e.g. 223 and 224), fluoro chloro (e.g. 226), tetrafluoro ethoxy (e.g. 112), tetrafluoro chloro (e.g. 105), difluoro methoxy (e.g. 205 and 210), difluoro hydroxyl (e.g. 199), and fluoro chloro methoxy (e.g. 207).

Applicants respectfully traverse the Examiner's statement that  $R^2$  is not extensively substituted. Applicants have provided diversity in the substitution of  $R^2$  as described in the following summary.

Diversity to R	Diversity to R ² substitution	
Example Numbers	Moiety	
2, 25, 42, 46, 47, 49, 51, 61,		
73, 145, 242, 245	\$	
3, 14, 15, 57, 58, 68, 69, 218,		
220, 222, 229, 231, 255, 263,	\{\bar{\}_{\sigma}\}_{\sigma}	
266	\$-\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
4, 6, 7, 8, 9, 27, 28, 29, 30, 36, 37, 44, 45, 50, 52, 53, 54, 60, 67, 75, 76, 79, 86, 87, 91, 92, 95, 96, 98, 99, 102, 107, 108, 109, 111, 114, 115, 116, 118, 119, 120, 121, 131, 142, 147, 148, 149, 151, 153, 154, 158, 161, 164, 165, 212, 213, 214, 215, 216, 225, 227, 241, 244, 247, 249, 250, 251, 252, 258, 259, 260, 273, 274, 275	www.	
12, 59,	\$ S	

Diversity to F	R ² substitution
Example Numbers	Moiety
13, 23, 269	
	\$
16, 236	
	\$Br
171	
	\$ F
62, 74, 140, 221	
	\$
21, 22, 31, 38, 39	
·	\$
265	
256	CI ST
229	Sr.
24	\$F

Diversity to F	2 ² substitution
Example Numbers	Moiety
32	NAVA PE
33, 34, 35, 40, 48	
	F F
228	
	S.—
55, 126, 130, 143, 268	
56, 128	
	₩ Br
63, 64, 65, 72, 113, 123, 125,	
129, 133, 134, 135,136, 137,	E
138, 139, 141, 150, 155, 156,	\{\xi\)
162, 163, 166, 167, 168, 169, 170,177, 193, 194, 253,	F
70	F
77	

Diversity to R ² substitution	
Moiety	
\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	
3	
\$	
CI F	
\$	
\$NH ₂	
NH NH	
\$	
\$	

Diversity to F	R ² substitution
Example Numbers	Moiety
104, 110	
	, o
	\$-\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
105	_
	} \
	F F
106	
	\$-_\
112	
	\$
117, 122, 272,	
	F
124	
	\$ F
127	
	\$ - F
152	
	₹————————————————————————————————————
171	_
	₹ F

Diversity to R	2 ² substitution
Example Numbers	Moiety
172, 173, 174, 175, 176, 181,	
182, 183, 184, 185, 187, 188,	, ,
189, 195, 196, 197	No.
178, 179	
	The state of the s
180, 199,	
	S CH
190	
	HO
191	0
	F O F F
199	HO
270	
	\$ - \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \

Diversity to R ² substitution	
Example Numbers	Moiety
200	
	, s
144, 146, 157	
	F. J. F.
	F John Ton Ton Ton Ton Ton Ton Ton Ton Ton To
205,	
	l die
	F
207,	0 0
	The state of the s
210	
	E Proper
237, 239, 257	
232, 233, 261, 262	
219	
	н,с
264	

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Diversity to F	² substitution
Example Numbers	Moiety
265	
223, 224	a—————————————————————————————————————
211	F P
228	S
226	±
235	F
238	F—————————————————————————————————————
243	F
253	F

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Diversity to R ² substitution	
Example Numbers	Moiety
254	o F F
267	Fr
271	F

As to R³, applicants have provided diverse moieties. Substituents include for example chlorine, alkoxy, cyano, thioalkyl, azido, amino, dialkylamino, hydrogen, phenoxy, alkyl and piperidinyl.

Applicants have also amended claims 22 and 95 to remove the following non-elected species: 2-[5-chloro-6-(2-chloro-6-fluorophenyl)[1,2,4]triazolo[1,5-a]pyrimidin-7-yl]-1,3-cyclohexanedione,

2-[5-chloro-6-(2-chloro-6-fluorophenyl)[1,2,4]triazolo[1,5-a]pyrimidin-7-yl]cyclohexanone and

2,5-dichloro-7-(4-methyl-1-piperidinyl)-6-[2-chloro-6-fluorophenyl][1,2,4]triazolo[1,5-a]pyrimidine. Applicants retain the right to pursue these non-elected species in a divisional application.

The Examiner has stated that the art, by way of a search, does not provide teaching as to triazolopyrimidine compounds in oncology and does not provide guidance to the skilled oncologist to select a compound from the large number covered by Formula I.

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In answer to the Examiner's statement, applicants have provided a specification which provides sufficient teaching and guidance to the skilled oncologist to effectively choose a compound from those of Formula (I). The activity of compounds of Formula (I) observed over a broad panel of tumors for example(lung, colon, cervical, glioblastoma, melanoma) as exemplified in the specification provides strong evidence that the compounds of Formula (I) broadly target many different tumor types. The compounds of Formula (I) target microtubules and have shown activity across a diverse panel of tumor cells consistent with a microtubule mechanism of action. This diverse panel of tumor cell data presented in the specification provides teaching and guidance to the skilled oncologist to choose a compound of Formula (I).

The Examiner has stated that with regard to claim 75 and with further regard to dependent claims 74, 76, 77, 79-81, 83-85, 87-93 and 95-97 and as described in Tables 4 and 5 that a larger dose is still required for the claimed compounds of Formula (I) when compared to Taxol, Vincristine, Doxorubicin and Mitoxantrone. Additionally, as further stated by the Examiner that the activity of the claimed compounds in MDR cancerous cells is not any better than Nocodazole.

Applicants respectfully traverse the rejection. Applicants believe that the claims as amended comply with 35 USC § 112 first paragraph. Applicants point the Examiner to tables 4 and 5 wherein the data clearly show that the representative examples of compounds of Formula (I) are not substrates for either of the two clinically best characterized MDR transporters Pgp and MXR. Applicants have shown in experiments described on pages 97-99 of the specification that the basis for the resistance of new cell lines (KB, KB 8.5 and KB VI) are the expression of the drug transporter now known as P-glycoprotein (P-gp), the product of the MDR1 gene. Together, the three cell lines (KB, KB 8.5 and KB VI) form a set which can be used to determine if a compound of the invention is a substrate of P-glycoprotein. Should the IC₅₀ values of a representative compound of the invention, be determined to be about the same on KB (no P-gp expression), KB 8.5 (moderate P-gp expression) and KB VI (high P-gp expression), then the compound of the invention is not a substrate of P-gp. However, if the IC₅₀ of the compound is substantially higher on KB 8.5 and KB VI than on KB, the compound of the invention is a substrate of P-gp. The IC₅₀ of paclitaxel is more than 1000-fold higher on KB VI than on KB because paclitaxel is a good substrate of P-gp. Representative examples of compounds of this invention were tested on this set of cell lines

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(see the specification on pages 97-98) and, as shown on page 98 of the specification in Table 4. As described and presented in Table 4 of the specification representative examples tested had essentially the same IC₅₀ values for all three cell lines (KB, KB 8.5 and KB VI) which indicates that the compounds are not substrates of P-gp, and they are able to overcome this form of multidrug resistance. As further presented in Table 4, the IC₅₀ values for Taxol, Vincristine, Colchicine, Doxorubicin and Nocodazole all increase when proceeding across each individual row from KB to KB 8.5 to KB VI showing them to be substrates of P-gp. Taxol, Vincristine and Doxorubicin are used in cancer therapy, where Colchicine is approved for treatment of gout and Nocodazole is used in research. As further described in the specification (pages 98-99), similar experiments were done with the S1 human colon carcinoma cell line, and the S1-M1 cell line derived from it, which expresses another multidrug transporter called MXR. Representative examples of compounds of the invention were tested on the S1-M1 and S1 cell lines and were found to have the same  $IC_{50}$  values. The data as presented in Table 5 on pages 98-99 of the specification provide experimental evidence that the compounds are not substrates of the MXR transporter, and therefore overcome multidrug resistance mediated by MXR. In contrast, the IC₅₀ value of the clinically-used anti-cancer agent mitoxantrone was over 2000-fold higher on the S1-M1 cell line than on the S1 cell line. Moreover, applicants do not believe that it is a requirement of 35 USC 112 to show superiority over Nocodazole or any other drug.

Applicants believe they have complied with 35 USC 112, first paragraph and respectfully ask the Examiner to reconsider and withdraw the rejections to Claims 2-4, 6-8, 10-12, 14-20, 22, 67, 74-77, 79-81, 83-85, 87-93 and 95-98. Applicants respectfully request that the Examiner enter the amendment, reconsider the rejections in light of the remarks herein and amendments to the claims, and allow the application. Favorable treatment is earnestly solicited.

Respectfully submitted,

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